

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (U-MOSIII)

# TPC6005

Notebook PC Applications

Portable Equipment Applications

- Low drain-source ON resistance:  $R_{DS(ON)} = 21 \text{ m}\Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 10 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = 10 \text{ }\mu\text{A}$  (max) ( $V_{DS} = 30 \text{ V}$ )
- Enhancement model:  $V_{th} = 0.5 \text{ to } 1.2 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 200 \text{ }\mu\text{A}$ )

## Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristics		Symbol	Rating	Unit
Drain-source voltage		$V_{DSS}$	30	V
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )		$V_{DGR}$	30	V
Gate-source voltage		$V_{GSS}$	$\pm 12$	V
Drain current	DC (Note 1)	$I_D$	6	A
	Pulse (Note 1)	$I_{DP}$	24	
Drain power dissipation ( $t = 5 \text{ s}$ ) (Note 2a)		$P_D$	2.2	W
Drain power dissipation ( $t = 5 \text{ s}$ ) (Note 2b)		$P_D$	0.7	W
Single pulse avalanche energy (Note 3)		$E_{AS}$	5.8	mJ
Avalanche current		$I_{AR}$	3	A
Repetitive avalanche energy (Note 4)		$E_{AR}$	0.22	mJ
Channel temperature		$T_{ch}$	150	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	-55 to 150	$^\circ\text{C}$

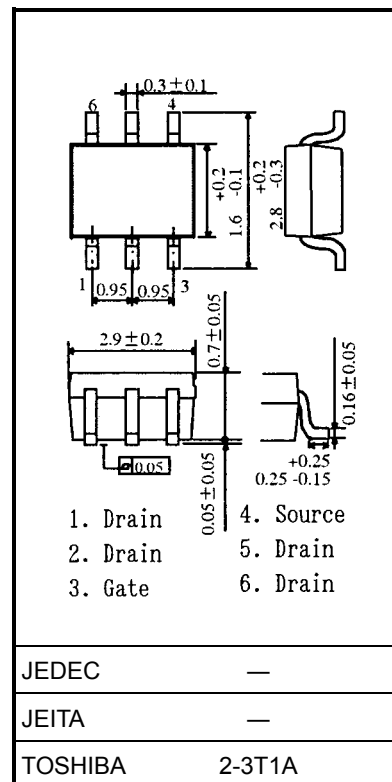
## Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to ambient ( $t = 5 \text{ s}$ ) (Note 2a)	$R_{th(ch-a)}$	56.8	$^\circ\text{C/W}$
Thermal resistance, channel to ambient ( $t = 5 \text{ s}$ ) (Note 2b)	$R_{th(ch-a)}$	178.5	$^\circ\text{C/W}$

Note: (Note 1), (Note 2), (Note 3), (Note 4), (Note 5) Please see next page.

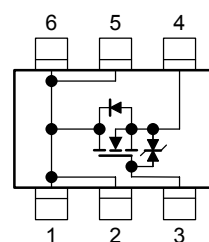
This transistor is an electrostatically sensitive device. Please handle it with caution.

Unit: mm

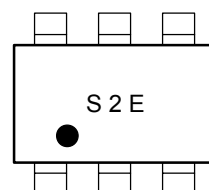


Weight: 0.011 g (typ.)

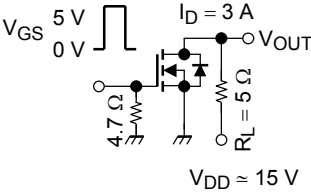
## Circuit Configuration



## Marking (Note 5)



## Electrical Characteristics (Ta = 25°C)

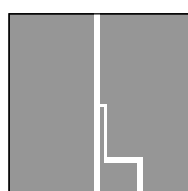
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I <sub>GSS</sub>	V <sub>GS</sub> = ±10 V, V <sub>DS</sub> = 0 V	—	—	±10	μA
Drain cut-OFF current		I <sub>DSS</sub>	V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V	—	—	10	μA
Drain-source breakdown voltage		V <sub>(BR) DSS</sub>	I <sub>D</sub> = 10 mA, V <sub>GS</sub> = 0 V	30	—	—	V
		V <sub>(BR) DSX</sub>	I <sub>D</sub> = 10 mA, V <sub>GS</sub> = -12 V	18	—	—	
Gate threshold voltage		V <sub>th</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 200 μA	0.5	—	1.2	V
Drain-source ON resistance		R <sub>DS (ON)</sub>	V <sub>GS</sub> = 2.0 V, I <sub>D</sub> = 3 A	—	31	41	mΩ
			V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 3 A	—	27	35	
			V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 3 A	—	21	28	
Forward transfer admittance		Y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 3 A	5	10	—	S
Input capacitance		C <sub>iss</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0 V, f = 1 MHz	—	1420	—	pF
Reverse transfer capacitance		C <sub>rss</sub>		—	170	—	
Output capacitance		C <sub>oss</sub>		—	180	—	
Switching time	Rise time	t <sub>r</sub>	 V <sub>DD</sub> ≈ 15 V Duty ≤ 1%, t <sub>w</sub> = 10 μs	—	8	—	ns
	Turn-ON time	t <sub>on</sub>		—	13	—	
	Fall time	t <sub>f</sub>		—	18	—	
	Turn-OFF time	t <sub>off</sub>		—	70	—	
Total gate charge (gate-source plus gate-drain)		Q <sub>g</sub>	V <sub>DD</sub> ≈ 24 V, V <sub>GS</sub> = 5 V, I <sub>D</sub> = 6 A	—	19	—	nC
Gate-source charge		Q <sub>gs</sub>		—	13.5	—	
Gate-drain (“miller”) charge		Q <sub>gd</sub>		—	5.5	—	

## Source-Drain Ratings and Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Pulse drain reverse current (Note 1)	$I_{DRP}$	—	—	—	24	A
Forward voltage (Diode)	$V_{DSF}$	$I_{DR} = 6 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	-1.2	V

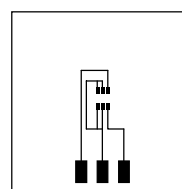
Note 1: Please use devices on condition that the channel temperature is below 150°C.

Note 2: (a) Device mounted on a glass-epoxy board (a) (b) Device mounted on a glass-epoxy board (b)



(a)

FR-4  
25.4 × 25.4 × 0.8  
Unit: (mm)



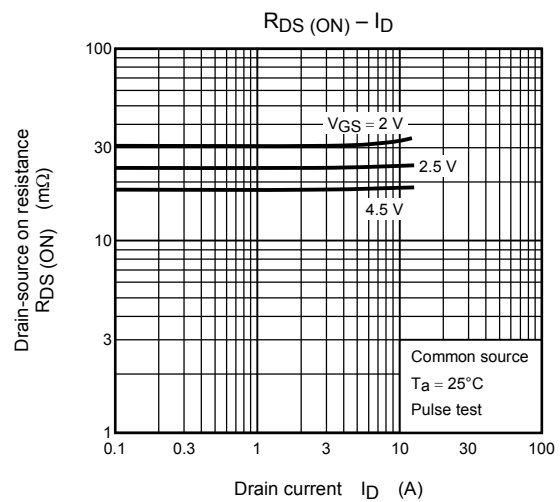
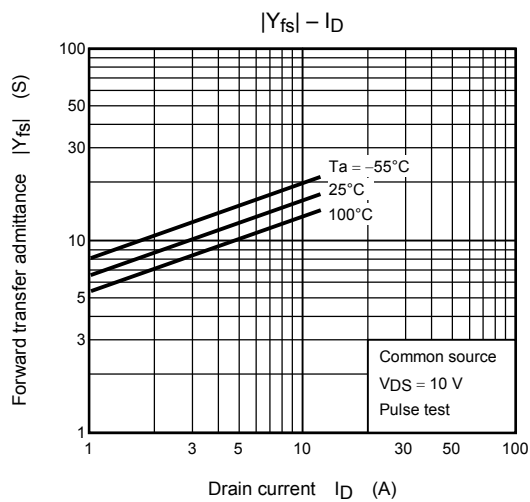
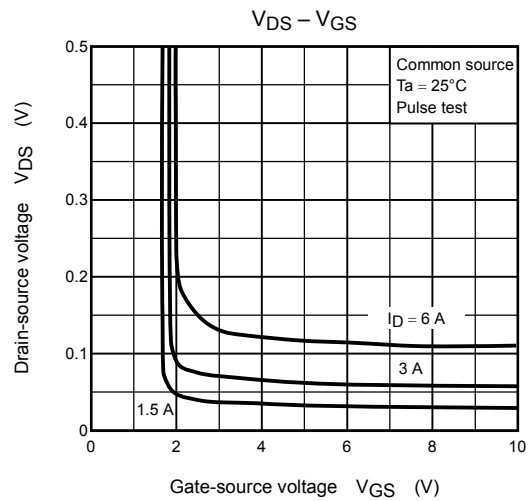
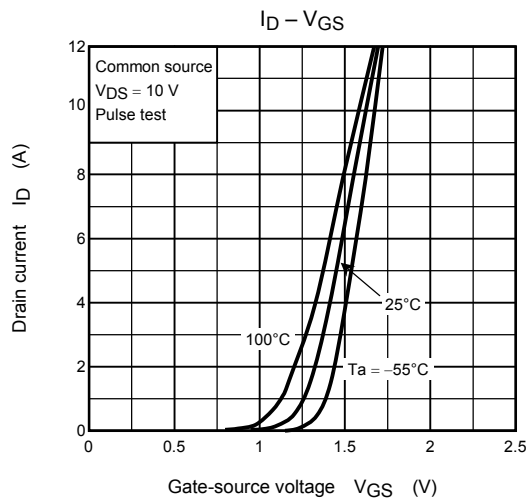
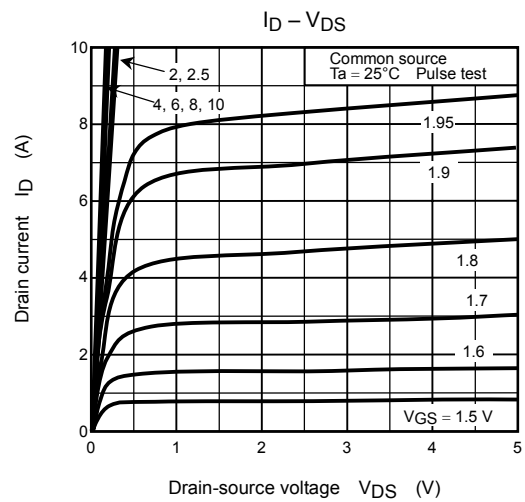
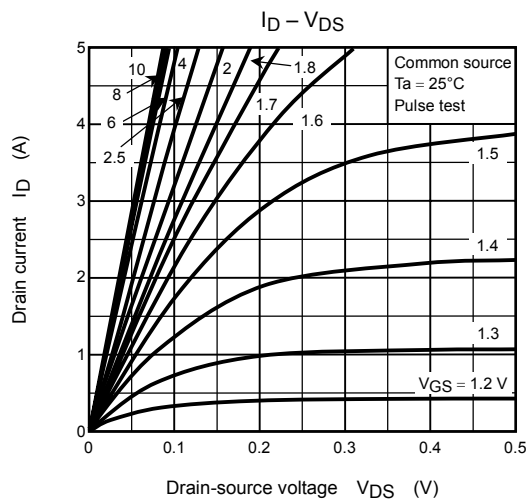
(b)

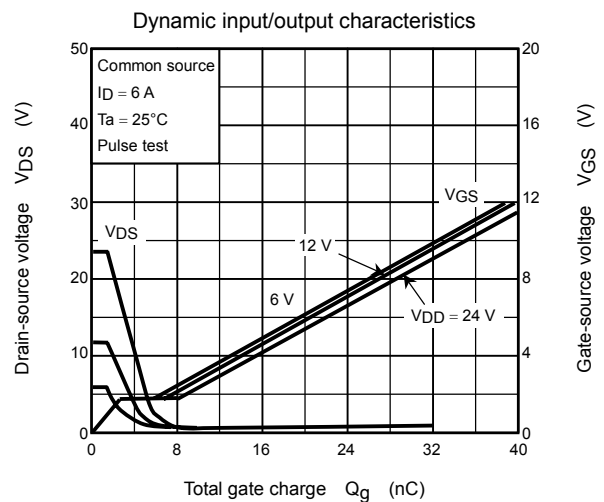
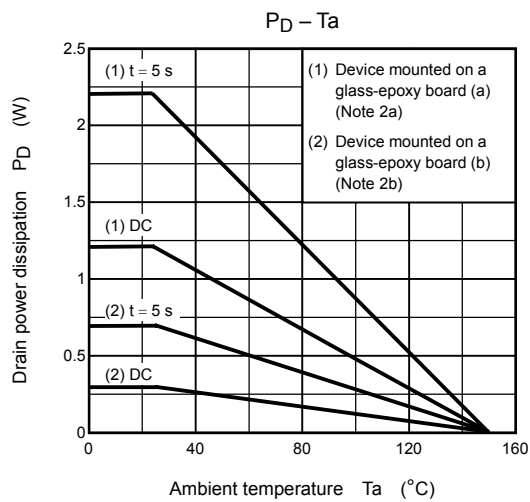
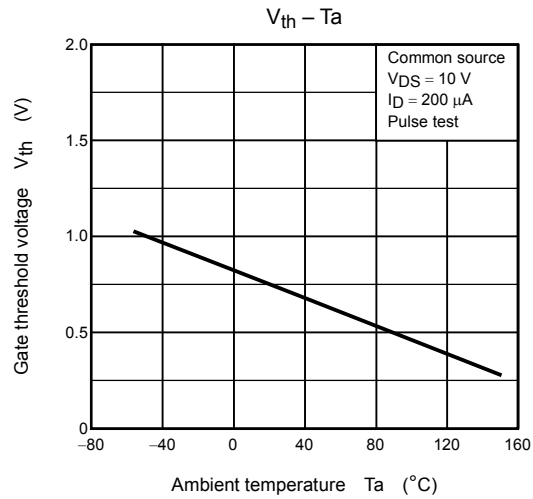
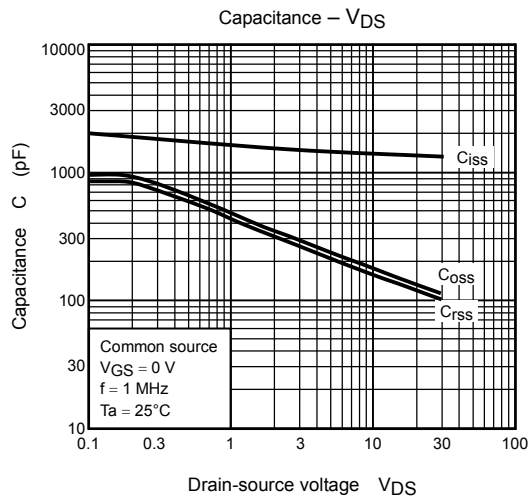
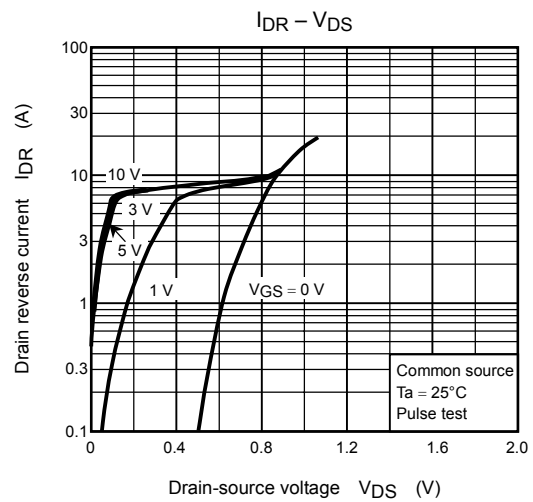
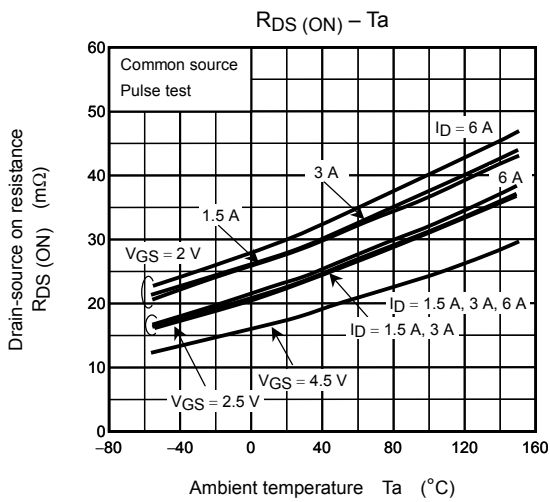
FR-4  
25.4 × 25.4 × 0.8  
Unit: (mm)

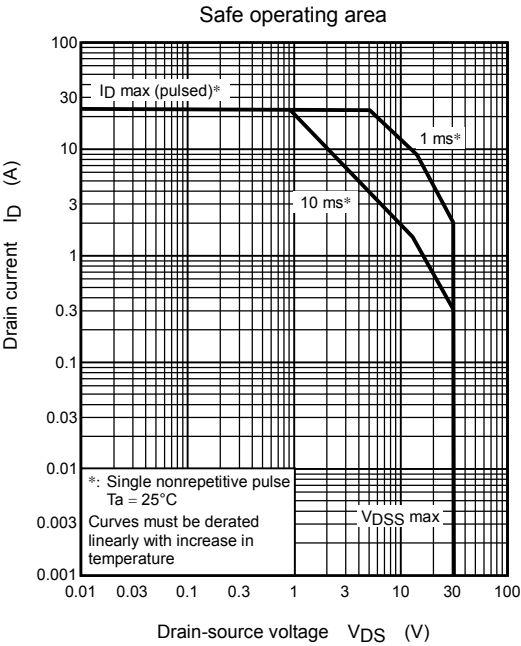
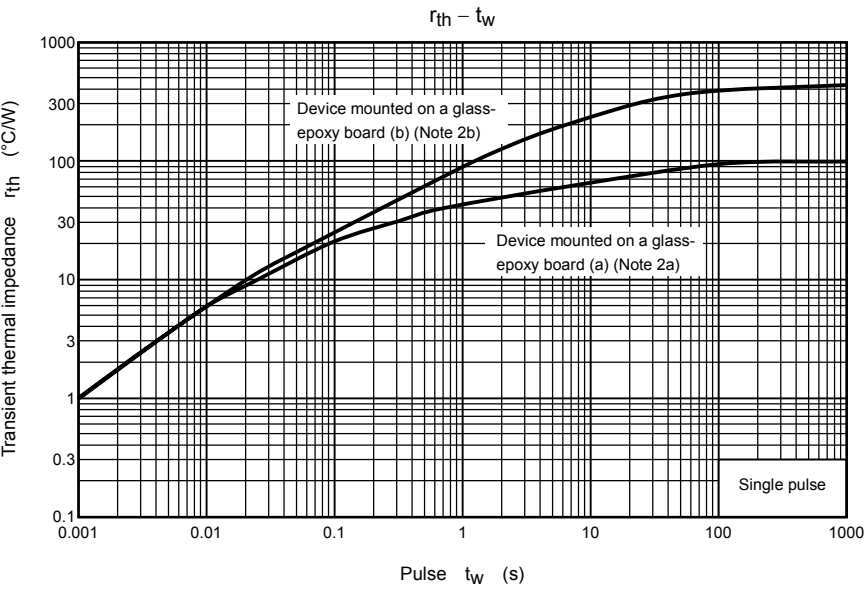
Note 3:  $V_{DD} = 24 \text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 0.5 \text{ mH}$ ,  $R_G = 25 \Omega$ ,  $I_{AR} = 3.0 \text{ A}$

Note 4: Repetitive rating; pulse width limited by maximum channel temperature

Note 5: Black round marking "•" locates on the left lower side of parts number marking "S2E" indicates terminal No.1.







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